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Proceedings of the regional Science Advisory Process on the Recovery Potential Assessment of Pugnose Minnow (*Opsopoeodus emiliae*)

1 November 2012

Burlington, ON

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Co-chairperson

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Compte rendu du processus de consultation scientifique régional sur l'évaluation du potentiel de rétablissement du petit-bec (*Opsopoeodus emiliae*)

Le 1 novembre 2012

Burlington (Ont.)

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Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

Avant-propos

Le présent compte rendu a pour but de documenter les principales activités et discussions qui ont eu lieu au cours de la réunion. Il contient des recommandations sur les recherches à effectuer, traite des incertitudes et expose les motifs ayant mené à la prise de décisions pendant la réunion. Le compte rendu peut aussi faire l'état de données, d'analyses ou d'interprétations passées en revue et rejetées pour des raisons scientifiques, en donnant la raison du rejet. Bien que les interprétations et les opinions contenues dans le présent rapport puissent être inexactes ou propres à induire en erreur, elles sont quand même reproduites aussi fidèlement que possible afin de refléter les échanges tenus au cours de la réunion. Ainsi, aucune partie de ce rapport ne doit être considérée en tant que reflet des conclusions de la réunion, à moins d'indication précise en ce sens. De plus, un examen ultérieur de la question pourrait entraîner des changements aux conclusions, notamment si l'information supplémentaire pertinente, non disponible au moment de la réunion, est fournie par la suite. Finalement, dans les rares cas où des opinions divergentes sont exprimées officiellement, celles-ci sont également consignées dans les annexes du compte rendu.

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TABLE OF CONTENTS

SUMMARY v
INTRODUCTION 1
DETAILED DISCUSSION 1
SPECIES DESCRIPTION 2
POPULATION STATUS 2
HABITAT REQUIREMENTS 2
RECOVERY POTENTIAL MODELING 3
THREAT STATUS 5
REVIEW OF PROJECTS AND ACTIVITIES IN PUGNOSE MINNOW HABITAT 6
PATHWAYS OF EFFECT & NON-HABITAT RELATED THREATS 7
SOURCES OF UNCERTAINTY 7
TERMS OF REFERENCE REVIEW 8
REFERENCES 11
Appendix 1. Terms of Reference 12
Appendix 2. Meeting Participants 16
Appendix 3. Agenda 17

SUMMARY

A regional science peer-review meeting was held on 1 November 2012 in Burlington, Ontario. The purpose of the meeting was to assess the recovery potential of Pugnose Minnow (*Opsopoeodus emiliae*) based on the 27 steps outlined in the Fisheries and Oceans Canada (DFO) National Frameworks. The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has designated Pugnose Minnow as Threatened (May 2012). It is currently listed on Schedule 2 of the *Species at Risk Act* (SARA) as Special Concern. The resulting Recovery Potential Assessment (RPA) Science Advisory Report will provide the information and scientific advice required for the Department to meet various requirements of SARA for this species including listing decisions, authorizations to carry out activities that would otherwise violate the SARA and development of recovery strategies. Meeting participants included experts from DFO, St. Clair Conservation Authority, and the Ontario Ministry of Natural Resources. This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents.

This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents. The Science Advisory Report and the supporting Research Documents, resulting from this advisory meeting, are published on the DFO Canadian Science Advisory Secretariat Website at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

SOMMAIRE

Une réunion régionale d'examen scientifique par les pairs a eu lieu le 1 novembre 2012 à Burlington, en Ontario. L'objectif de cette réunion était d'évaluer le potentiel de rétablissement du petit-bec d'après les 27 étapes présentées dans le cadre d'évaluation du potentiel de rétablissement (EPR) de Pêches et Océans Canada (MPO). Le Comité sur la situation des espèces en péril au Canada (COSEPAC) a désigné le petit-bec comme étant menacé (mai 2012). À l'heure actuelle, cette espèce est inscrite à l'annexe 2 de la *Loi sur les espèces en péril* (LEP) en tant qu'espèce préoccupante. L'avis scientifique découlant de l'EPR fournira les renseignements et l'avis scientifique dont le Ministère a besoin pour respecter les diverses exigences de la *LEP* à l'égard de cette espèce, ce qui comprend les décisions relatives à l'inscription et le fait de permettre des activités qui seraient normalement contraires aux interdictions prévues dans la LEP et à l'élaboration de stratégies de rétablissement. On comptait parmi les participants des experts du MPO, de l'Office de protection de la nature de la région St. Clair, et du Ministère des richesses naturelles de l'Ontario. Le présent compte rendu résume les discussions pertinentes de la réunion d'examen par les pairs et présente les modifications qui seront apportées aux documents de recherche connexes.

Le présent compte rendu résume les discussions pertinentes de la réunion d'examen par les pairs et présente les révisions qui seront apportées aux documents de recherche connexes. L'avis scientifique et les documents de recherche à l'appui découlant de cette réunion de consultation sont publiés sur le site Web du Secrétariat canadien de consultation scientifique du MPO à l'adresse suivante : http://www.dfo-mpo.gc.ca/csas-sccs/index-fra.htm.

INTRODUCTION

In April 1985, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designated Pugnose Minnow as Special Concern. The status was re-examined in May 2000, at which time it was maintained as Special Concern. In May 2012 the status of the species was once again assessed and was re-designated as Threatened. The reason for the change was as follows: "This fish is a small-bodied species with a restricted and declining distribution that inhabits river, stream and lake habitats. The species is threatened by habitat loss, habitat degradation from nutrient and sediment loading, climate change and several exotic species. The overall level of threat has been assessed as high." Pugnose Minnow is listed on Schedule 2 of the *Species at Risk Act* (SARA) as Special Concern. Its current Endangered Species Act listing is also Special Concern.

The purpose of the meeting, as described in the Terms of Reference (Appendix 1), was to assess the recovery potential of Pugnose Minnow. The RPA is a science-based peer review process that assesses the current status of the species by addressing the 27 steps in the National Frameworks outlined in the Revised Protocol for Conducting Recovery Potential Assessments (DFO 2007a, b). The current state of knowledge about habitat requirements, threats to both habitat and Pugnose Minnow, and measures to mitigate these impacts, is included in the Science Advisory Report. A peer-review meeting was held at the Canadian Centre for Inland Waters, Burlington, Ontario, on 1 November 2012 to discuss the Pugnose Minnow RPA.

Meeting participants included Fisheries and Oceans Canada, St. Clair Conservation Authority, and the Ontario Ministry of Natural Resources (Appendix 2). The meeting followed the agenda outlined in Appendix 3.

This proceedings report summarizes the relevant discussions from the peer-review meeting and presents revisions to be made to the associated research documents. The Research Documents (Bouvier and Mandrak 2012; Young and Koops 2012) provide information on the working papers presented at the workshop; the Science Advisory Report summarizes the current understanding of the distribution and habitat requirements of this species, along with recovery targets and times to recovery, while considering various management scenarios (DFO 2012).

DETAILED DISCUSSION

The meeting co-chair provided the participants with an introduction to the SARA listing and DFO Science advisory processes. He explained how the RPA will be used, as well as the objectives of the meeting. A draft RPA had been developed by DFO and provided to participants in advance of the meeting. The draft report was the basis for discussion and participants were encouraged to add to or change the material as needed to ensure that the best, most accurate information was included.

SPECIES DESCRIPTION
Presenter: Lynn Bouvier

The presentation included a description of the Pugnose Minnow; descriptions of three similar species: Pugnose Shiner (*Notropis anogenus*), Golden Shiner (*Notemigonus crysoleucas*), and Blackchin shiner (*Notopis heterodon*); its growth rate and reproduction information; diet; and North American distribution.

The participants had no questions or comments to add to this presentation.

POPULATION STATUS ASSESSMENT
Presenter: Lynn Bouvier

The presentation on population status included population distribution, abundance and trajectory of the Pugnose Minnow, as well as the certainty that the researchers had of the information's accuracy.

A participant asked why the RPA treated the Pugnose Minnow in the Lake St. Clair tributaries as one population when COSEWIC did not; it was explained that the decision was made because there was no barrier to movement between the tributaries and the stressors in the different areas were the same.

Some conversation about the definition of the term "location" arose from this question. A participant noted that the word has not been defined adequately because different committees apply it in different ways. No changes were made to the research document as a result of this discussion.

A participant noted that one record, which appears to be mapped to Big Creek near Amherstburg should actually be mapped to the Detroit River. The presenter agreed to update the document accordingly.

During the discussion of Maxwell Creek a participant noted that there were some discrepancies between the numbers given in the research document and the COSEWIC report. The presenter explained that some samples were determined to be misidentified after the COSEWIC report had been written. The research document explained the reason for the discrepancies.

Regarding the validity of the "possibly extirpated" classification for McDougall Drain it was mentioned that this location has not been re-visited in recent years. The presenter stated that a note should be added to research document indicating the need to resample McDougall Drain to determine whether Pugnose Minnow is extirpated from the system.

In the discussion of abundance and population trajectory, the presenter noted that the second column in her chart of the Pugnose Minnow populations should have read "abundance index" rather than "relative abundance index." The presenter noted that she would check her research document to see if this should be updated, or if it was simply an error in the presentation.

HABITAT REQUIREMENTS
Presenter: Lynn Bouvier

The presentation included a description of the different life stages and the habitat requirements for each of the three life stages: spawning, juvenile, and adult. The habitat descriptions were broken down into three categories: functions, features and attributes. A participant offered

examples of each category that had been given at a previous meeting. The presenter proposed to add these examples to future presentations.

Another participant noted that in prior Pugnose Minnow sampling, water level seemed to be an important factor in determining critical habitat; however, it was unclear at this point what influences water level had on Pugnose Minnow distribution and abundance. The participant noted a large lake water level influence on the lower reaches of the drains and rivers where Pugnose Minnow is found. It is possible that the Lake St. Clair water levels are moderating the turbidity in the areas where Pugnose Minnow is found. One of the participants inquired whether it was possible for the Lake St. Clair water to be diluting the turbidity in the lower reaches. One of the participants noted that profiles of the river body are available for the Sydenham River. Since the link between water levels and Pugnose Minnow abundance and presence is currently unknown, it may not be relevant to include this information in the research document.

A participant also asked if seining had been done around Walpole Island. The response was that seining had not been done there, and that the area constituted a knowledge gap.

The conversation turned back to the functions, features and attributes table, at which time a participant expressed a concern around listing the Secchi depth values that were listed in the "Optimal Habitat" column. Another participant agreed, stating that DFO sampling had been more systematic than ROM sampling, which resulted in a broader range of depths than those listed in the table. It was proposed that the heading "Optimal Habitat" column heading should be changed to be reflect the information that was in the column. The presenter suggested that the column may be changed to "Scientific Literature". The rest of the participants agreed to the change.

The presenter raised the concern that limited data made it difficult to fill in the attributes column of the functions, features and attributes table. There was considerable conversation surrounding topics such as water depth, vegetation, turbidity, the inclusion of sub-optimal habitat in the table, whether historic locations should be considered in terms of locations for recovery, and the process of identifying critical habitat based on Science advice. It was noted that the discussion of how the advice is used helped to form the advice that was given, rather than determine what advice was given, and was therefore acceptable under the rules of the meeting. The participants agreed to leave the table as it was.

During the conversation on the functions, features, and attributes table, a participant expressed concern that the existing sampling methods are insufficient to accurately determine population numbers. The presenter agreed to add this concern to the sources of uncertainty listed in the research document.

RECOVERY POTENTIAL MODELING

Presenter: Jennifer Young

The presentation on recovery potential modeling addressed life cycle and parameter estimates, population sensitivity, allowable harm, and recovery targets for abundance and habitat, as well as key uncertainties and the science advice on allowable harm.

In the discussion of allowable harm, the presenter proposed that the group examine two categories of harm: chronic and transient. It was explained that the reason for the introduction of a second type of harm is because science advice provided in previous RPAs that indicated that there was "no scope for allowable harm" was not being interpreted correctly. No scope for harm in this context meant that you were not able to harm the population growth rate, and did not

mean that you were not able to harm a single individual. There was potentially the scope for harming individuals as long as the population growth rate over a given amount of time was not decreasing. The solution to this was to model a second type of harm, one we are calling 'transient harm'. Transient harm represents a one-time removal of individuals from the population and models what the results of this removal may be over a given amount of time.

The presenter gave definitions for both chronic and transient harm and asked for feedback on whether or not this delineation was useful and whether or not the criteria for each term were suitable. The participants agreed that the delineation would be helpful, but they needed more data on Pugnose Minnow population size in order to offer advice using these definitions. There was some discussion surrounding how to determine allowable harm given the limited information available. The participants agreed that they could not provide guidance at that time.

The discussion of recovery targets included recovery target approaches, minimum viable population (MVP) criteria, the selection process for MVP criteria, the effect of catastrophes, extinction thresholds, and habitat targets.

There was some discussion surrounding the likelihood of catastrophe; however, no changes were made to the research document.

The presenter explained how the available habitat was calculated, stating that she had made rough calculations of the area of the tributaries based on the length and width of the water body. She qualified her calculations by stating that the available habitat might not all be of suitable quality for Pugnose Minnow to live in. Another participant added that more thorough calculations had been done for the available habitat of the Detroit River. The presenter volunteered to add a note about her calculations to the research document.

During the review of the definitions of chronic and transient harm, a participant noted that the definition of chronic harm did not include a temporal component (e.g. "reduces a population growth rate over the long term"). The phrase "over the long term" was added to the end of the definition.

During the review of the science advice on allowable harm a participant noted that the description of a scenario in which chronic harm may be considered was missing the adjective "chronic." The presenter noted that the word needed to be added to the research document. The presenter also offered tentative growth rate percentages for allowable transient harm, but the participants agreed that there was not enough data to support the use of such numbers.

A participant asked if transient harm would be allowed if the number of Pugnose Minnow were below its recovery target. Some discussion followed; it was agreed that because there was such limited data on Pugnose Minnow populations, no chronic or transient harm should be allowed for a population that is in decline or unknown.

During the discussion on habitat targets a participant asked if the numbers provided represented the area required for two individual Pugnose Minnow during the lifespan. It was clarified that the numbers provided represented that habitat necessary for the entire population and the two individuals simply represented the extinction scenario. Also, during the habitat targets discussion, the presenter noted that she should add some language to the text on how the habitat estimates were calculated.

Science advice on allowable harm bullets was discussed by the group. It was noted that the words "over the long term" should be included at the end of the definition for chronic harm. A

participant also noted that the third bullet related to allowable chronic harm did not include the word "chronic". It was agreed that this was an oversight, and the word "chronic" would be added to the summary bullet.

There was some discussion around whether or not science advice on allowable harm should be given for stable or increasing populations, since all known populations of Pugnose Minnow are currently in decline. The participants first concluded that the scenarios were not necessary for this particular species; however, this issue was revisited near the end of the meeting and it was decided that these guidelines would be included as a template for future recovery potential assessments.

A participant raised the concern that stating that there was no scope for allowable harm to Pugnose Minnow did not allow for certain necessary activities in Pugnose Minnow habitat. After considerable discussion, the following new wording was provided in the science advice on allowable harm:

- When population trajectory is declining there is no scope for allowable chronic harm at the population level.
- When population trajectory is declining or unknown, even low levels of transient harm may compromise recovery or shorten the time to extirpation.
- When population trajectory is increasing there is scope for allowable transient harm.
- When population abundance is unknown the scope for allowable transient harm can only be assessed once population data are collected.

THREAT LEVEL ASSESSMENT

Presenter: Lynn Bouvier

The presentation on threat status overviewed the likelihood and impact of threats, as well as the certainty associated with threat impact.

It was established that threat likelihood (TLH) would be categorized as "known" (K), "likely" (L), "unlikely" (U), or "unknown" (UK); threat impact (TI) would be categorized as "high" (H), "medium" (M), "low" (L), or "unknown" (UK). The certainty associated with threat impact (C) would be categorized as 1, or derived from causative studies; 2, or derived from correlative studies; or 3, or expert opinion.

During the overview of terms, a participant asked about the use of the word "site" in the definitions of the levels of threat impact. The question was whether or not Lake St. Clair and its tributaries were considered to be one site. The presenter proposed changing the word "site" to "population" for clarity, or re-wording the definition

Another participant asked if the category of "exotic species" might be renamed to "invasive" or "aquatic invasive species." The group decided that the change to "invasive" might be prudent, provided that a proper definition of it was given, because it was used by other ministries. The presenter offered to look into the definition and make the change if appropriate.

In the review of Lake St. Clair and its tributaries, a participant asked if turbidity and sediment loading was less of a concern in the lake than it was in the smaller water bodies. It was agreed that the lake would be clearer than the tributaries; however, because there was a lot of uncertainty around Pugnose Minnow turbidity tolerance, and because Pugnose Minnow in these waterbodies is considered one population, the group agreed that the assessments of K and H for this category were appropriate. It was decided that wording would be added to the text to indicate that turbidity was lower in the lake.

During the discussion of habitat alteration, a participant raised the issue of fluctuating water levels in Lake St. Clair and whether or not they should be addressed in the table. After some discussion, another participant suggested that referring to the reports on regulating the upper Great Lakes, particular that recent report on Huron/Michigan because it discusses what causes the water level fluctuations. That would be a good source to refer to when talking about the causes of water level fluctuations. Then we can make the link to our concern that fluctuations water levels (decreases in water levels) may influence the amount of habitat available. Need to do more research on the potential effects of water level fluctuations on changes to edge habitat. It was decided that this concern would be highlighted as a knowledge gap in the habitat alteration section of the research document.

In the discussion of contaminants and toxic substances, a participant mentioned that there are pipelines under the St. Clair River and suggested that petroleum products be added to the list of toxic substances. The presenter agreed.

In the discussion of invasive species participants considered a number of species which were not listed in the document that might affect the Pugnose Minnow. Ultimately, they decided to add Common Carp (*Cyprinus carpio*) to the list because it increases turbidity in the water; they also added Round Goby (*Neogobius melanostomus*) and Tubenose Goby (*Proterorhinus marmoratus*), which would prey on Pugnose Minnow eggs, and dreissenid mussels because they would occupy spawning sites. After some discussion around how these species behave in Pugnose Minnow habitat, the participants agreed to keep the TI listed as L.

The Detroit River was the next waterbody in the review. In the discussion of incidental harvest a participant asked if the TI should be H rather than L. They argued that, while the likelihood of harvest is low, capturing the Pugnose Minnow could have a dramatic impact on the population. A conversation followed around harvesting methods, previous numbers captured through sampling, and the modeling in the research document. The participants agreed that the numbers of Pugnose Minnow and Pugnose Minnow juveniles that would be captured was low, and therefore would not have a dramatic impact on the population. The TI of incidental harvest was therefore left as L.

In the review of terminology used to discuss the overall threat to Pugnose Minnow, the presenter offered definitions of two categories of harm: chronic and ephemeral. It was decided to change the term "ephemeral" to "transient" to match the terms used in the discussion of allowable harm. No other changes were made to this section of the research document.

REVIEW OF PROJECTS AND ACTIVITIES IN PUGNOSE MINNOW HABITAT

Presenter: Dave Balint

The review of projects and activities in Pugnose Minnow habitat aimed to give all work, projects and activities that took place in Pugnose Minnow habitat from 2009-2011. Participants discussed whether these activities were likely to increase, decrease, or remain the same in the future; they also discussed the impact those activities would have with standard and additional mitigation methods in place.

The presenter opened by explaining that he did not have three years' worth of data for his review. He also noted that, given the conversations that arose from this meeting, projects and activities occurring in Pugnose Minnow habitat may be having a greater impact than was originally thought.

During the discussion of future projects, a participant noted that a record number of fish habitat review requests were submitted for municipal drains in 2012. The number had nearly doubled from the year before. The participant added that money was available to spend on drainage, and that these sorts of activities would not be likely to slow down soon. Another participant suggested that activities such as tiling headwaters might decrease water supply, and that Katie Stammler's graduate work may be cited to support the argument. They also suggested that damming the drains to hold back water for irrigation might cause a threat to Pugnose Minnow. Although that practice is not permitted, the participants agreed that it does happen; one person noted that they had seen designs that facilitated the practice.

The participants discussed whether or not there were additional mitigation methods that could be recommended. One participant asked if fish salvage is used as a mitigation when approving a permit. Another participant responded that it is in the permit but it may not be followed properly by the proponent. Another participant noted that a sampling protocol document does exist that is provided with SAR permits. The participant also noted that the document does require updating because we do not have a good handle on effort. Several participants added that proponents conducting the salvages did not always follow procedures adequately; however, participants agreed that this was a separate discussion for a later date.

PATHWAYS OF EFFECT & NON-HABITAT RELATED THREATS

Presenter: Lynn Bouvier

The presentation addressed the Pathways of Effect (PoE), alternatives to activities that cause harm to Pugnose Minnow, and methods of mitigating harmful effects.

In the discussion of feasible mitigation methods a participant asked if the suggestions made by Science had to comply with existing laws. Another responded that they did not; they were simply ideas from which a client could theoretically work.

In the review of mitigation methods for incidental harvest participants suggested that Science might recommend limiting harvest by providing quota and/or timing windows. No other changes were made to the research document.

SOURCES OF UNCERTAINTY

Presenter: Lynn Bouvier

The presentation addressed sources of uncertainty related to population structure, habitat, recovery potential modeling, and threats to Pugnose Minnow.

While discussing sources of uncertainty surrounding habitat, the presenter noted that the document stated that studies were required to validate observations on "habitat preferences," a phrase which has a specific definition. The presenter decided to remove the word "preferences" from the sentence. Another participant stated "Larval surveys are needed to identify both nursery grounds," which the presenter noted should read "nursery and spawning areas."

The sources of uncertainty surrounding recovery potential modeling originally included longevity; however, a participant noted that it did not need to be. The presenter agreed to remove it from this section of the research document.

Lastly, a participant suggested that populations of Pugnose Minnow sampled from habitat where one would expect to find them be compared to populations of Pugnose Minnow sampled from

habitat where one would not expect to find them. Another participant responded that this approach had been taken to a certain degree with Pugnose Shiner.

The participants had nothing more to add to this section of the research document.

TERMS OF REFERENCE REVIEW

Presenter: Nicholas Mandrak

The terms of reference included assessing the Pugnose Minnow and its population status, assessing uses of its habitat, determining the scope for management to facilitate recovery, determining scenarios for mitigation and alternatives to activities, and assessing allowable harm.

The participants reviewed the following criteria:

1. Evaluate present status for abundance and range and number of populations.
   - The presenter stated that this point was covered adequately during the meeting.

2. Evaluate recent species trajectory for abundance (i.e., numbers and biomass focusing on mature individuals) and range and number of populations.
   - The participants evaluated the trajectory during the discussion of the population status, but because of limited data, could not give the requested numbers.

3. Estimate, to the extent that information allows, the current or recent life-history parameters (total mortality, natural mortality, fecundity, maturity, recruitment, etc.) or reasonable surrogates; and associated uncertainties for all parameters.
   - The participants made the estimation to the extent that their information allowed during the discussion of recovery potential modeling.

4. Estimate expected population and distribution targets for recovery, according to DFO guidelines (DFO 2005, and 2011).
   - During the discussion of recovery potential modeling the participants were able to make estimates for population, but not distribution targets for recovery.

5. Project expected population trajectories over three generations (or other biologically reasonable time), and trajectories over time to the recovery target (if possible to achieve), given current parameters for population dynamics and associated uncertainties using DFO guidelines on long-term projections (Shelton *et al.* 2007).
   - The participants did not know the trajectory, and so could not make a projection.

6. Evaluate residence requirements for the species, if any.
   - This point was covered in the research document; the Pugnose Minnow have no residence requirements because it does not construct a residence.

7. Provide functional descriptions (as defined in DFO 2007b) of the required properties of the aquatic habitat for successful completion of all life-history stages.
   - The participants covered this point to the extent possible during the discussion of habitat requirements.

8. Provide information on the spatial extent of the areas that are likely to have these habitat properties.

- The participants could not cover this point due to insufficient information and uncertainty surrounding the existing information.

9. Identify the activities most likely to threaten the habitat properties that give the sites their value, and provide information on the extent and consequences of these activities.
- The participants covered this point in the discussion of threat status.

10. Quantify how the biological function(s) that specific habitat feature(s) provide to the species varies with the state or amount of the habitat, including carrying capacity limits, if any.
- The participants were not able to cover this point due to a lack of data.

11. Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.
- The participants did not quantify the restraints; however, they used this habitat information to list the populations in the discussion of population status.
- A participant noted that there may be a pump system acting as a barrier in Maxwell Creek; a participant agreed to find out this information. If a barrier existed, it would be added to the research document.

12. Provide advice on how much habitat of various qualities / properties exists at present.
- The participants provided a rough estimate of existing Pugnose Minnow habitat during the discussion of population status; however, due to a lack of information, they could not state the quality of the habitat.

13. Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present, and when the species reaches biologically based recovery targets for abundance and range and number of populations.
- Using the available data the participants provided information that could inform the requested advice.

14. Provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached, in the context of all available options for achieving recovery targets for population size and range.
- The participants agreed that this was not information that they could provide.

15. Provide advice on risks associated with habitat "allocation" decisions, if any options would be available at the time when specific areas are designated as critical habitat.
- The participants provided insight into habitat quantity which could help inform related decision making.

16. Provide advice on the extent to which various threats can alter the quality and/or quantity of habitat that is available.
- The participants covered this point in the review of threat status.

17. Assess the probability that the recovery targets can be achieved under current rates of parameters for population dynamics, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.
- The participants did not have the data to cover this point.

18. Quantify to the extent possible the magnitude of each major potential source of mortality identified in the pre-COSEWIC assessment, the COSEWIC Status Report, information from DFO sectors, and other sources.

- In the discussion of threat status the participants identified, but could not quantify, potential sources of mortality.

19. Quantify to the extent possible the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets.

- Limited data made it impossible to directly quantify the likelihood that the population could increase; however, the participants gave information that could inform decision making around this topic in the discussion of recovery potential modeling.

20. Assess to the extent possible the magnitude by which current threats to habitats have reduced habitat quantity and quality.

- The matter of habitat quality was addressed in text. Limited data prevented the participants from covering the point fully.

21. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all feasible measures to minimize/mitigate the impacts of activities that are threats to the species and its habitat (steps 18 and 20).

- The participants covered this point through their discussion of pathways of effect.

22. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all reasonable alternatives to the activities that are threats to the species and its habitat (steps 18 and 20).

- The participants covered this point through their discussion of pathways of effect.

23. Using input from all DFO sectors and other sources as appropriate, develop an inventory of activities that could increase the productivity or survivorship parameters (steps 3 and 17).

- Limited data prevented the participants from covering this point.

24. Estimate, to the extent possible, the reduction in mortality rate expected by each of the mitigation measures in step 21 or alternatives in step 22 and the increase in productivity or survivorship associated with each measure in step 23.

- Limited data prevented the participants from covering this point.

25. Project expected population trajectory (and uncertainties) over three generations (or other biologically reasonable time), and to the time of reaching recovery targets when recovery is feasible; given mortality rates and productivities associated with specific scenarios identified for exploration (as above). Include scenarios which provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.

- Limited data prevented the participants from covering this point.

26. Recommend parameter values for population productivity and starting mortality rates, and where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts of listing the species.

- The participants covered this point indirectly by identifying uncertainties and knowledge gaps.
- A lack of information prevented the participants from covering this point fully.

27. Evaluate maximum human-induced mortality which the species can sustain and not jeopardize survival or recovery of the species.

- The participants provided information that could inform decision making around this topic in the discussion of recovery potential modeling.
- A lack of information prevented the participants from covering this point fully.

The author stated that she would modify the documents from the meeting in accordance with the group's comments. The revised documents were be used to complete the Science Advisory Report, which would be sent out to the participants for review.

REFERENCES

Bouvier, L.D., and Mandrak, N.E. 2012. Information in support of a Recovery Potential Assessment of Pugnose Minnow (*Opsopoeodus emiliae*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/135. v + 26 p.

DFO. 2007a. Documenting habitat use of species at risk and quantifying habitat quality. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/038.

DFO. 2007b. Revised protocol for conducting recovery potential assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/39.

DFO. 2012. Recovery Potential Assessment of Pugnose Minnow (*Opsopoeodus emiliae*) in Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/069.

Young, J.A.M., and Koops, M.A. 2012. Recovery potential modelling of Pugnose Minnow (*Opsopoeodus emiliae*) in Canada. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/136. xx + xx p.

Appendix 1. Terms of Reference

Recovery Potential Assessment of Pugnose Minnow (*Opsopoeodus emiliae*)

Regional Peer Review Meeting – Central and Arctic Region

1 November 2012
Burlington, ON

Co-Chairpersons: Lynn Bouvier and Nicholas Mandrak

Context

When the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) designates aquatic species as threatened or endangered, Fisheries and Oceans Canada (DFO), as the responsible jurisdiction under the *Species at Risk Act* (SARA), is required to undertake a number of actions. Many of these actions require scientific information on the current status of Pugnose Minnow, threats to its survival and recovery, and the feasibility of its recovery. Formulation of this scientific advice has typically been developed through a Recovery Potential Assessment (RPA) that is conducted shortly after the COSEWIC assessment. This timing allows for the consideration of peer-reviewed scientific analyses into SARA processes including recovery planning.

Pugnose Minnow was originally assessed as Special Concern by COSEWIC in 1985 and 2000. In May 2012, it was re-examined by COSEWIC and was designated as Threatened. Pugnose Minnow is currently listed as Special Concern on Schedule 1 of SARA. The recovery potential assessment will support the update status report, recovery strategy, permitting, and identification of critical habitat.

In support of listing recommendations for this species by the Minister, DFO Science has been asked to undertake an RPA, based on the National Frameworks (DFO 2007a and b). The advice in the RPA may be used to inform both scientific and socio-economic elements of the listing decision, as well as development of a recovery strategy and action plan, and to support decision-making with regards to the issuance of permits, agreements and related conditions, as per section 73, 74, 75, 77 and 78 of SARA. The advice generated via this process will also update and/or consolidate any existing advice regarding this species.

Objectives

- To assess the recovery potential of Pugnose Minnow (*Opsopoeodus emiliae*).

Assess current/recent species/ status

1. Evaluate present status for abundance and range and number of populations.

2. Evaluate recent species trajectory for abundance (i.e., numbers and biomass focusing on mature individuals) and range and number of populations.

3. Estimate, to the extent that information allows, the current or recent life-history parameters (total mortality, natural mortality, fecundity, maturity, recruitment, etc.) or reasonable surrogates; and associated uncertainties for all parameters.

4. Estimate expected population and distribution targets for recovery, according to DFO guidelines (DFO 2005, and 2011).

5. Project expected population trajectories over three generations (or other biologically reasonable time), and trajectories over time to the recovery target (if possible to achieve), given current parameters for population dynamics and associated uncertainties using DFO guidelines on long-term projections (Shelton *et al.* 2007).

6. Evaluate **residence requirements** for the species, if any.

Assess the Habitat Use

7. Provide functional descriptions (as defined in DFO 2007b) of the required properties of the aquatic habitat for successful completion of all life-history stages.

8. Provide information on the spatial extent of the areas that are likely to have these habitat properties.

9. Identify the activities most likely to threaten the habitat properties that give the sites their value, and provide information on the extent and consequences of these activities.

10. Quantify how the biological function(s) that specific habitat feature(s) provide to the species varies with the state or amount of the habitat, including carrying capacity limits, if any.

11. Quantify the presence and extent of spatial configuration constraints, if any, such as connectivity, barriers to access, etc.

12. Provide advice on how much habitat of various qualities / properties exists at present.

13. Provide advice on the degree to which supply of suitable habitat meets the demands of the species both at present, and when the species reaches biologically based recovery targets for abundance and range and number of populations.

14. Provide advice on feasibility of restoring habitat to higher values, if supply may not meet demand by the time recovery targets would be reached, in the context of all available options for achieving recovery targets for population size and range.

15. Provide advice on risks associated with habitat "allocation" decisions, if any options would be available at the time when specific areas are designated as critical habitat.

16. Provide advice on the extent to which various threats can alter the quality and/or quantity of habitat that is available.

Scope for Management to Facilitate Recovery

17. Assess the probability that the recovery targets can be achieved under current rates of parameters for population dynamics, and how that probability would vary with different mortality (especially lower) and productivity (especially higher) parameters.

18. Quantify to the extent possible the magnitude of each major potential source of mortality identified in the pre-COSEWIC assessment, the COSEWIC Status Report, information from DFO sectors, and other sources.

19. Quantify to the extent possible the likelihood that the current quantity and quality of habitat is sufficient to allow population increase, and would be sufficient to support a population that has reached its recovery targets.

20. Assess to the extent possible the magnitude by which current threats to habitats have reduced habitat quantity and quality.

Scenarios for Mitigation and Alternative to Activities

21. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all feasible measures to minimize/mitigate the impacts of activities that are threats to the species and its habitat (steps 18 and 20).

22. Using input from all DFO sectors and other sources as appropriate, develop an inventory of all reasonable alternatives to the activities that are threats to the species and its habitat (steps 18 and 20).

23. Using input from all DFO sectors and other sources as appropriate, develop an inventory of activities that could increase the productivity or survivorship parameters (steps 3 and 17).

24. Estimate, to the extent possible, the reduction in mortality rate expected by each of the mitigation measures in step 21 or alternatives in step 22 and the increase in productivity or survivorship associated with each measure in step 23.

25. Project expected population trajectory (and uncertainties) over three generations (or other biologically reasonable time), and to the time of reaching recovery targets when recovery is feasible; given mortality rates and productivities associated with specific scenarios identified for exploration (as above). Include scenarios which provide as high a probability of survivorship and recovery as possible for biologically realistic parameter values.

26. Recommend parameter values for population productivity and starting mortality rates, and where necessary, specialized features of population models that would be required to allow exploration of additional scenarios as part of the assessment of economic, social, and cultural impacts of listing the species.

Allowable Harm Assessment

27. Evaluate maximum human-induced mortality which the species can sustain and not jeopardize survival or recovery of the species.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document(s)

Participation

- Fisheries and Oceans Canada (DFO) (Science, Ecosystems and Fisheries Management and Policy sectors, Habitat and Species at Risk programs)
- Province of Ontario
- Conservation Authorities
- Other invited experts

References

COSEWIC. 2012. COSEWIC assessment and status report on Pugnose Minnow (*Opsopoeodus emiliae*) in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 38 p.

DFO. 2005. A framework for developing science advice on recovery targets for aquatic species in the context of the Species at Risk Act. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/054.

DFO. 2007a. Revised Protocol for Conducting Recovery Potential Assessments. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2007/039.

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DFO. 2011. A Complement to the 2005 Framework for Developing Science Advice on Recovery Targets in the Context of the *Species At Risk Act*. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2010/061.

Shelton, P.A., B. Best, A. Cass, C. Cyr, D. Duplisea, J. Gibson, M. Hammill, S. Khwaja, M. Koops, K. Martin, B. O'Boyle, J. Rice, A. Sinclair, K. Smedbol, D. Swain, L. Velez-Espino, and C. Wood. 2007. Assessing recovery potential: long-term projections and their implications for socio-economic analysis. DFO Can. Sci. Advis. Sec. Res. Doc. 2007/045.

Appendix 2. List of Participants

Name		Affiliation
Muriel	Andreae	St. Clair Conservation Authority
Sheri	Andres	Fisheries and Oceans Canada - Policy
Dave	Balint	Fisheries and Oceans Canada - Habitat
Jay	Barnucz	Fisheries and Oceans Canada - Science
Lynn	Bouvier (co-Chair)	Fisheries and Oceans Canada - Science
Amy	Boyko	Fisheries and Oceans Canada - Species at Risk
Scott	Gibson	Ontario Ministry of Natural Resources
Marten	Koops	Fisheries and Oceans Canada - Science
Nick	Mandrak (co-Chair)	Fisheries and Oceans Canada - Science
Dave	Marson	Fisheries and Oceans Canada - Science
Scott	Reid	Ontario Ministry of Natural Resources
Sara	Venskaitis	Rapporteur
Jen	Young	Fisheries and Oceans Canada - Science

Appendix 3. Agenda

Recovery Potential Assessment of Pugnose Minnow (*Opsopoeodus emiliae*)

Regional Advisory Meeting – Central and Arctic Region

1 November 2012
Burlington, ON

Co-Chairpersons: Lynn Bouvier and Nicholas Mandrak

Time	Title	Presenter
9 am	Welcome, Introductions & Background	Nick Mandrak
	Species Description & Population Status	Lynn Bouvier
	Habitat Requirements	Lynn Bouvier
	Health Break	
	Recovery Potential Modeling	Jennifer Young
	Lunch	
	Threat Status	Lynn Bouvier
	Review of Projects and Activities	Dave Balint
	Health Break	
	Pathways of Effect & Non-habitat Related Threats	Lynn Bouvier
	Sources of Uncertainty	Lynn Bouvier
	Review of Terms of Reference	Nick Mandrak
5 pm	End of Day	